

# Tunable Opto-electronic Oscillator Based on Photonic Integration of Ultra-High Q Resonators on a SiN Chip, Phase I

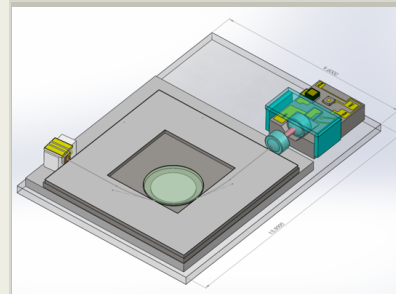
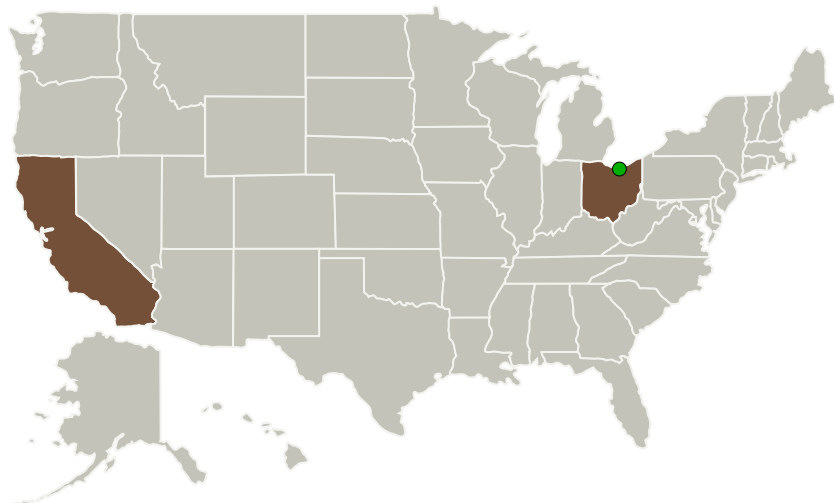
Completed Technology Project (2017 - 2018)



## Project Introduction

The team comprising OEwaves Inc. and UC Davis offers to develop and demonstrate a SiN-platform integrated photonic circuit suitable for a spectrally pure chip-scale tunable opto-electronic RF oscillator (OEO) that can operate as a flywheel in high precision optical clock modules, as well as radio astronomy, spectroscopy, and local oscillator in radar and communications systems. The effort comprises integration of an ultra-high quality (Q) crystalline whispering gallery mode (WGM) microresonator with multiple lithographically defined photonic and electronic components and devices (including a laser, a detector and waveguides) on a single platform with nanometer-scale feature sizes. The proposed oscillator will be packaged in a volume of approximately 1cc, with net power consumption of less than 500 mW. The oscillator will produce a minimum of 10 mW of output RF power in Ka frequency band, and its single sideband (SSB) phase noise will be as low as -60 dBc/Hz at 10 Hz, and -160 dBc at 1 MHz and higher Fourier frequencies.

## Primary U.S. Work Locations and Key Partners



Tunable Opto-electronic Oscillator Based on Photonic Integration of Ultra-high Q Resonators on a SiN Chip, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
OEwaves, Inc.	Lead Organization	Industry	Pasadena, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
University of California-Davis(UC Davis)	Supporting Organization	Academia Asian American Native American Pacific Islander (AANAPISI)	Davis, California

## Primary U.S. Work Locations

California	Ohio
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## Project Transitions

▶ **June 2017:** Project Start

✓ **June 2018:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138695>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

OEwaves, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

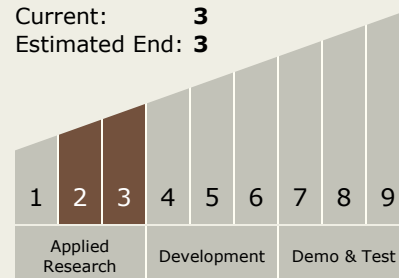
Carlos Torrez

### Principal Investigator:

Andrey Matsko

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 3

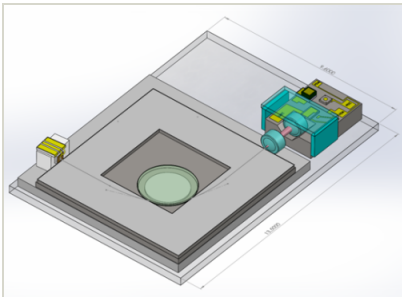


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## Images



### Briefing Chart Image

Tunable Opto-electronic Oscillator  
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Ultra-high Q Resonators on a SiN  
Chip, Phase I Briefing Chart Image  
(<https://techport.nasa.gov/image/135568>)

## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.2 Radio Frequency
    - └ TX05.2.2 Power-Efficiency

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System